3. On the Linguatulid Arachnid *Raillietiella furcocerca* [Diesing, 1835] Sambon, 1922. By GEORGE S. GIGLIOLI, M.D. Pisa.

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This species was described by Diesing in 1835 under the name of *Pentastoma furcocercum*, from specimens collected by Natterer in South America. His original description, translated from the German, runs as follows:—

"The worms are from 9 to 10 lines in length; 1 line thick at the anterior extremity, ½ at the posterior. They are grey in colour, while their internal organs, which can be seen in transparency, are brown and somewhat marked in white and reddish. The body is spindle-shaped and presents a linear annulation, which is most marked at the middle part of the body, while it gradually disappears towards the two extremities. On each ring are numerous stigmata disposed along a line at regular intervals. The cephalic extremity is somewhat flattened and is obtusely triangular. At its apex it presents the oval oral opening. The hook-pouches, which are situated symmetrically behind the mouth, are borne by obtusely conical structures. Each pouch is protected by three rounded pads, two lateral and one median, which is situated over the hook. Each pouch contains two hooks, probably united at their base; they are situated one over the other. The upper one is nearly straight and short; the lower one is longer and more medially directed. The posterior extremity is bifid. The male can be distinguished from the female by the penis, situated on a papilla on the mid-ventral line on the first anterior ring. I have found the two caudal points divergent in a female, but the two sexes are similar in size."

Later, in his 'Systema Helminthum,' Diesing again describes the same species under the name *Pentastoma bifurcatum*:—

"*Corpus* subfusiforme retrorsum attenuatum, extremitate caudali bifurcatum, annulato-plicatum, annulis linearibus. *Caput* obtuse triangulare depressiusculum. *Os* ovale margine lato calloso apice truncato, inter bothria obtuse triloba in formam coni truncati disposita situm. *Hamulis* inæqualibus. Long. fem. 9–13‴; crass. antice ultra 1‴; postice ½‴. Femina cauda sua bifurcata, in aliis emarginata, marem multo minorem et graciliorem sub coitu probabiliter excipit."

In 1898 Sir Arthur Shipley, in his monograph on Linguatulidæ, reproduced Diesing's description under the name *Porocephalus bifurcatum*.

In 1910 Sambon included this species in the genus *Raillietiella*, and, following the rule in zoological nomenclature, again adopted the original specific denomination given by Diesing in 1835, so that this tongue-worm is now known under the name of *Raillietiella furcocerca*.

Through the kindness of Dr. Khalil, of the Department of Helminthology of the London School of Tropical Medicine, I have been able to examine two female specimens of this parasite, collected from the lungs of an *Amphisbœna alba*, which died in the London Zoological Gardens, and I would now submit the following as a more accurate description of the external morphology of this species:—

Length 26 mm.; breadth 1 mm. (anteriorly). The cephalothorax is the bulkiest part of the body, and from it the abdomen tapers gradually towards the caudal extremity. The body is straight and delicate. The cephalothorax is roughly triangular in shape, with the generic characters of *Raillietiella* very well marked. The mouth is terminal, but situated on the ventral surface. The oral papilla is shield-shaped and large, with a well-marked chitinous outline. It is surmounted by two small rounded papillæ, which are terminal. Laterally, and slightly dorsally to these, other two long finger-shaped papillæ are situated, which are directed laterally. These structures occupy the apex of a large fleshy cone which forms the anterior part of the cephalothorax, and is very slightly flexed ventrally. At its base the anterior pair of hooks are situated. The whole chitinous hook-apparatus is remarkably small, especially the root. They are supported, or rather enclosed, by a voluminous fleshy structure, which protrudes laterally, so that when the hook is at rest not even its tip is free. The hooks are, in fact, only visible by transparency. Their fleshy base presents a somewhat complicated form, in which three parts can be distinguished: an external rounded pad or mass situated laterally to the hook and slightly behind it; a similar but smaller structure symmetrically situated on the internal aspect of the hook; and a compressed, transparent hood, situated over the two preceding organs, and which shrouds the hook, both root and blade. The hood is open at its lower end, so as to allow the extrusion of the hook-blades, but these are so small that only a very little part of the blade can ever be freed from its fleshy sheath. The hooks are smooth and simple, the posterior pair slightly larger, and supported by a much larger and stronger base. As in other species of the genus *Raillietiella*, the large sensitory papillæ, corresponding to the anterior or medial pair of hooks, are finger-shaped and of unusual size, and situated on the latero-dorsal surface of the cephalothorax. Behind these and a little nearer to the median dorsal line two other smaller papillæ are visible. These I have not observed in other species (*R. boulengeri*, *R. geckonis*).

The abdomen is fairly cylindroid in its anterior third, and then tapers gradually to the posterior extremity, which is acuminated and bifid. The annulation, though present, is practically effaced, so that the number of rings cannot be given. On the first five body-rings very distinct acuminated papillæ are symmetrically situated on the latero-ventral margin. The genital opening is on the mid-ventral line on the first body-ring. The cuticle covering the body is studded with small eminences which give it a rough appearance, particularly evident on the large papillæ. The body-wall being very fine and transparent, some anatomical characters can be made out:—

The intestine is straight and dorsal; it receives the short arcuate œsophagus slightly behind its anterior end, and opens dorsally by the anal orifice, which is situated between the two caudal appendages. The spermathecæ are rounded and symmetrically situated a little dorsally to the vagina, which opens through the anterior genital pore. The uterus is an ample sac which fills the whole body-cavity from the spermathecæ to the caudal extremity and partly embraces the intestine. It is full of eggs. On the internal surface of the body-wall the parietal gland-cells can be seen arranged in small clusters or nests; they are situated in a more or less regular annular series, two or more to each ring. The specimens described by Diesing evidently were not mature, as appears from the double hooks. Moreover, many of them were found not in the lungs, but in other organs of their hosts; they were therefore probably still migrating through the tissues to the lungs.

The hosts in which Natterer found the specimens described by Diesing are not many, but they belong to different orders; Diesing, in fact, gives three snakes: *Coluber lichtensteini*, *C. flaviventris*, *Boa constrictor*, and a lizard, *Amphisbæna flavescens*. As I have already observed in other papers dealing with this group of parasites, the genus *Raillietiella*, differing from all the others of the family Linguatulidæ, comprehends species of parasites coming from hosts of very different families: from Ophidia, Lacertidæ, and Amphibia.

According to Diesing *R. furcocerca* is to be found both in several snakes and in a lizard of very peculiar habits, the *Amphisbæna*. Although until now there is no direct evidence to the contrary, I think it improbable that the same species should inhabit such different hosts. For this reason I have thought it well to give a more complete description of this parasite, so that comparison may be made with specimens obtained from snakes.

Although several species of *Raillietiella* have been described, both in the adult and semi-adult forms, we have as yet no knowledge of the younger developmental forms, nor of the intermediary hosts in which they live. Hitherto the majority of intermediary hosts for those members of the family, at least, which are found in snakes, have been mammals; a large variety of mammalia have often been found to act as intermediary hosts to the same species of parasite. *Armillifer amillatus*, according to Noc, has been found at its larval stage in 36 species of mammals. Other species, parasitic in crocodiles, have in all probability fish as their intermediary host. It is probable that all these immature forms, given under a variety of names, such as *P. gracile*, *P. crocodili*, and others, generally found in fish of the families Gymnotidæ, Characinidæ, and Siluridæ represent larval stages of the Sebekini. Moreover, the feeding-habits of their definite hosts render this hypothesis extremely probable. The same is probably the case with the genus *Reighardia*.

Many animals, in which tongue-worms of the genus *Raillietiella* have been found, are purely insectivorous in their feeding-habits. For example, the lizards of the genus *Calotes* and *Gecko* (*R. geckonis*), *Amphisbœna alba* (*R. furcocerca* (Diesing)); and the Amphibian, *Bufo melanostictus* (*R. indica* (Gedoelst, 1921)).

If even in the genus *Raillietiella*, as in all the others, there exists a biological cycle which evolves in two different hosts, it will be interesting to see in what intermediary host the larval forms of these parasites of insectivorous animals pass their existence, and how they manage to get into their definite host. Could the intermediary host of *Raillietiella* be an invertebrate animal?